9 COMPARISON OF ON SITE AND PHONE SURVEY RESULTS

This section compares the results of the telephone survey to the on site survey in a few key areas, such as house size, heating fuels and systems and manufactured housing

9.1 OVERVIEW

The telephone survey was larger than the on site (200 and compared to 158), also less intrusive and may possibly be more representative of the market. However, the on site data were collected by unbiased, experienced energy auditors, and may be more accurate. There are two major question arising:

1. Are there substantial differences between the samples of houses reflected in the on site and the telephone surveys?

2. Are there any major discrepancies between the telephone survey and on site results, and if so, can they be explained?

Comparing the responses from homeowner who participated in both the telephone and on site surveys provides some insights into these questions. To investigate the first question, we used house size and RBES compliance rate as the critical comparison points. Based on the measured, on site data, the telephone survey homes were slightly larger than the sample as a whole and RBES compliance slightly higher, but these differences were not statistically significant.

Consistent with other similar studies, one area of discrepancy between the on site and telephone surveys was the homeowners' perception of appliance efficiency as compared to verified Energy Star appliances. Based on the overlapping group of survey respondents, it appears that many more homeowners identified their appliances as "energy efficient" than actually selected Energy Star models, and a few apparently failed to recognize that their Energy Star appliances were energy efficient.

Other areas of concern included the much higher penetration of furnaces and electric hot water found in the telephone survey as compared to the on sites, and variations in the distribution of space heating fuels. Correcting for errors in homeowners' responses based on the group of dual respondents indicates that the results of the two surveys are actually fairly consistent in these areas.

The final issue requiring further investigation was the incidence of manufactured homes. While the two surveys seemed to have similar results on the surface, comparison of the underlying

responses raises the possibility that both surveys may have underestimated the incidence of manufactured homes.

9.2 HOUSE SIZE, PROGRAM PARTICIPATION AND RBES COMPLIANCE

House size, RBES compliance and program participant were three characteristics compared for the overlapping group of respondents to assess whether the homes included in the on site study were similar to the homes reflected in the telephone surveys. Analysis of the data suggests that the two surveys are quite similar on the basis of these three characteristics. The average house size of the homeowners who responded to both surveys was slightly larger than all on site survey participants (2,570 square feet for the overlapping participants as compared to 2,470 for the remaining on site houses).[1] The RBES compliance rate for the overlapping group was 61%, as compared to 58% for the on site survey at a whole. These differences are not statistically significant, which supports the conclusion that the on site survey is similar to the telephone survey with respect to house size and RBES compliance. The rate of self-reported participation in efficiency programs was virtually identical between the two groups at 32%.

However, the average self reported house size from the telephone survey was substantially different from the actual house size measured during the on site visit. The mean and median house sizes from the telephone survey are 2,175 and 2,000, respectively. The on site mean and median of 2,510 and 2,390 are in the range or 15 to 20% higher than the customer-reported areas. Since the on site visits include actual measurements of the homes, we concluded that the homeowner reports tend to be unreliable. To analyze this issue, we compared the house size as reported by the homeowner to the measured area from the on site for the 73 participants with data available from both sources. For smaller homes (under 2300 square feet), the homeowner reports were reasonably accurate on average. However, owners of larger houses (2300 square feet and up) tended to underestimate the size of their homes, sometimes by a large margin. For this segment of the sample, the average understatement was 640 square feet.

9.3 APPLIANCES

Phone survey participants were asked whether their appliances were “energy efficient” or “Energy Star” (if the respondent recognized the “Energy Star” designation). Through the on site visits, the auditors collected the make and model for the new appliances, and this information was used to verify the Energy Star models. There were 76 respondents who participated in both the phone and on site surveys.

As has been found in similar studies in other states, the phone responses indicate that most survey participants consider their appliances to be efficient. For refrigerators, about one-third of these respondents had Energy Star models, for clotheswashers, about two-thirds, and for

[1] This analysis was conducted using the measured area from the on site survey. This value was assumed to be more reliable than the customer-reported house sizes.

dishwashers about 40%. Also, 10% of responses regarding refrigerators and dishwashers indicated that the appliance was not efficient when it was an Energy Star model.

Table 9.1: Comparison of Appliance Responses

Phone Survey & On Site Overlap	Refrigerator	Clothes Washer	Dish-Washer
N [2]	49	29	42
Say "efficient" on phone	37	22	28
% say "efficient" on phone	76%	76%	67%
Verified Energy Star from on site	17	15	15
% verified Energy Star	35%	52%	36%
Both "efficient" and Energy Star	12	14	11
% both "efficient" & Energy Star	24%	48%	26%
% said “efficient” that are Energy Star	33%	63%	39%

9.4 SPACE HEATING FUELS AND SYSTEMS

The results of the on site and telephone surveys show some variation in the distribution of heating fuels and systems, as is shown in Table 9.1 below. One primary area of concern is that the telephone survey indicated about 70% of the homes had a hydronic system and 24% had forced air, as opposed to 82% and 14% from the site visits, respectively.

Table 9.2: Comparison of Heating Fuels and Systems

		Telephone Survey	On Site Survey
Heating Fuels			
	Oil	48%	42%
	Natural Gas	21%	19%
	Propane	20%	29%
	Other	11%	10%
Systems			
	Baseboard	51%	61%
	Radiant	19%	21%
	Forced Air	24%	14%
	Other	6%	4%

[2] N is the number of homes who responded to the questions regarding appliance efficiency on the phone survey, and had a new appliances and valid model number as verified by the on site visit.

We analyzed the 74 respondents of both surveys with complete heating system information to identify some of the potential issues.[3] This analysis uncovered some patterns of incorrect responses.

The telephone and on site surveys yielded the same responses for both the heating fuel and system type in 57 homes out of the 74 (77%). A number of homeowners were unable to distinguish between natural gas and propane, with most claiming to have natural gas when the fuel was actually propane (4 homes). The other major source of confusion regarding fuel type was identifying the primary heating system. Many homes had a wood stove as well as a fossil fuel central system, and some homeowners claimed to use wood as the primary fuel on the phone survey, but the on site visit results indicated that the fossil fuel system was the most commonly used (5 homes).[4]

Inconsistencies in categorizing the heating systems were identified in eleven homes (15%). The most frequent error was to claim a forced air system when the home had a hydronic system (4 homes), and three homeowners confused radiant and baseboard systems.

In the overlapping group of 74 homes with complete information, a total of ten homes were identified as having a forced air system in the telephone survey, as opposed to seven in the on site visits.[5] For this group of homes, the telephone survey overstated the penetration of forced air systems by 30%. Applying this correction factor to the telephone survey as a whole, the adjusted proportion of homes with forced air systems would be 17%. This result is not statistically different from the 14% estimated from the on site survey.

9.5 WATER HEATING FUELS

The telephone survey results indicate that 25% of the homes had electric DHW, as compared to the 8% incidence documented in the on site survey. The homeowners' responses seem to be largely unreliable for this particular piece of information. Comparing the water heating fuels for the 76 respondents to both surveys indicates that 17 of these homeowners claimed to have electric DHW, but it was verified to be the case in only four homes in the on site survey. If this error were applied to the telephone survey as a whole, only 6% of the telephone survey would be estimated to have electric hot water.

9.6 MODULAR HOMES

5 MODULAR HOMES

[3] We were unable to ascertain the primary heating fuel and system for two homes in the overlapping group of 76.

[4] The primary fuel was identified from the site visits from the percentage of load estimated for each heating system and the amount of fuel used by each system. This information was typically provided by the homeowner.

[5] Four homes were incorrectly identified as having furnaces, and one home failed to be identified as having a furnace in the telephone survey, for a net difference of three.

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Of the 158 homes in the on site survey, there were at least 23 modular homes and 4 double wide manufactured homes, accounting for 17% of the homes. This number compares favorably to the estimated 16% from the phone survey. When comparing the 76 homes with data from both the on site and telephone surveys, the overlapping data indicated there were 13 manufactured homes but only 9 (66%) were identified as such by the homeowner. If the error rate were consistent throughout the telephone survey, the penetration of manufactured homes would increase to 23%, which is the upper boundary of the confidence interval for the penetration of manufactured homes for the on site survey as a whole.

This result seems to indicate that the telephone survey may have underestimated the incidence of manufactured housing. However, it is possible that both the telephone and on site surveys exhibit the same bias for different reasons. In the on site survey, "manufactured home" was not a specific data point collected. These homes were identified reviewing from auditors' notes and builder information. It is possible that some modular homes were missed in this process. Since the homeowner responses were shown to be less than completely reliable, the 17% should be considered to be a lower boundary of the market share of residential new homes that are manufactured or modular housing.